OPINION ARTICLE

What a Cardiologist must know about Bayes' Syndrome

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BACKGROUND

Up to 1979, few studies had been published about atrial conduction abnormalities, the textbooks did not mention these disorders as independent of other different entities and there were no unified criteria regarding the terminology and definitions. (1-4)

In that year, Dr. Bayés de Luna published a paper in the Revista Española de Cardiología, suggesting that atrial conduction abnormalities could be divided into intraatrial and interatrial blocks (IAB). The latter should be divided, in turn, into partial and advanced IAB. Partial IAB exists when there is a delay of conduction in Bachmann´s bundle zone, evidenced by a P wave > 120 ms without a final negative component in the inferior leads. In advanced IAB, left atrial depolarization occurs due to caudocranial retrograde activation from the low right atrium (coronary sinus and to a lesser degree, the fossa ovalis), (5) generating a P wave > 120 ms but with a negative final component in the inferior leads.

FIRST PUBLICATIONS

In 1985, Dr. Bayés de Luna and his team analyzed 810.000 surface electrocardiograms (ECG) performed between 1974 and 1982 in a general hospital, and determined that the prevalence of advanced IAB was 0.1% and increased to 2% when patients with heart valve disease or cardiomyopathy were considered. This study used surface ECG and vectocardiogram (VCG) in 35 patients, and orthogonal ECG in another 29 patients. These groups were compared with other two control groups with heart disease (30 patients) and without heart disease (25 patients), using the criteria of partial and advanced IAB. (6) Similar to previous studies by Waldo et al. (in a canine model), this study showed that in patients with advanced IAB (Figure 1), left atrial activation was retrograde and caudocranial. (7)

Up to that moment, several authors implicitly included the concept of left atrial enlargement (LAE) when referring to IAB or p-wave ≥ 120 ms. However, the sensitivity of the ECG to detect LAE in the presence of partial or advanced IAB is 50%, and increases to 75% when a biphasic P wave with a final negative component > 40 ms in lead V1 is added to the criteria of IAB. Moreover, the sensitivity of the ECG was higher than that of the VCG, 75% and 56%, respectively, using the echocardiogram as the gold standard for the diagnosis of LAE. (6)

In 1988, Dr. Bayés de Luna published a new study of patients undergoing 24-hour Holter monitoring, which included 16 patients with advanced IAB exhibiting different heart diseases compared with a control group with equivalent clinical and echocardiographic characteristics. After a 30-month follow-up period, 93.7% of the patients with IAB presented supraventricular tachycardia versus only 27.7% of the patients without advanced IAB ($p < 0.01$). At the same time, the group with advanced IAB presented a higher significant incidence of supraventricular premature beats (75%) compared with the control group (16.6%) ($p < 0.01$). (8)

ASSOCIATION OF INTERATRIAL BLOCK WITH SUPRAVENTRICULAR ARRHYTMIAS

In 2003, Agarwal et al. published an article comparing two groups (308 patients each): one presenting new onset atrial fibrillation (AF) with another control group in sinus rhythm, adjusted by age and sex. After 16 months of follow-up, the prevalence of IAB was 52% in the group with new onset AF versus 18% in the group with sinus rhythm ($p < 0.001$). (9)

Ariyarajah (from Spodick's group, another author who has largely contributed to the understanding of this condition), demonstrated that in 66 patients with probable diagnosis of cardioembolic stroke, defined by computed tomography or magnetic resonance imaging and evaluated by a neurologist, those with IAB in

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the ECG had a greater probability of presenting LAE or a thrombus in the left atrium (OR 7.44, 95% CI 2.162-25.61; p < 0.001, r = 0.3). (10)

SPECIALIST CONSENSUS REPORT

Despite these findings and publications, there was still lack of agreement in the definitions, pathophysiology and, particularly, in the association with supraventricular arrhythmias. This prompted Dr. Bayés to coordinate an international consensus report on IAB that was published in 2012 in the Journal of Electrocardiology. (11) This consensus report determined that IAB fulfills the three criteria that define an ECG pattern as heart block or conduction disorder (11, 12):

a) The ECG pattern may appear transiently, and the pattern may change abruptly and progressively to more advanced forms.

b) The ECG pattern may appear without other associated pathological processes such as cardiac chamber enlargement or ischemia, although in many cases, one or more of these conditions may coexist.

c) A similar ECG pattern may be reproduced experimentally.

Regarding reproducibility, experimental studies have demonstrated that cutting Bachmann´s bundle results in an ECG pattern with P wave > 120 ms and biphasic (±) morphology in inferior leads. (7)

It has also been demonstrated that after ablation of interatrial conduction zones along the right atrial septum, without affecting atrioventricular conduction, interatrial conduction delay may occur leading to interatrial conduction block with an increase of P wave duration ≥ 120 ms. (13)

All previously mentioned studies using ECG and VCG were validated invasively with endocardial mapping. (14)

By analogy with other types of block, (sinoauricular or auriculoventricular), IAB may be classified as first-degree (partial), second-degree (transient IAB or atrial aberrancy) or third-degree (advanced) (Figure 1). (12) Our group has initiated several studies about this entity and prefers to classify IAB as partial and advanced (Figure 2).

CURRENT EVIDENCE

We have recently published different series analyzing the role of IAB to predict AF. The aim of one of these studies was to determine if advanced IAB could predict AF recurrence at 1-year follow up in 61 patients who had undergone pharmacological cardioversion of paroxysmal AF. The study concluded that patients with AF recurrence at one year had advanced IAB in 90% of cases (p < 0.001), and multivariate analysis demonstrated that persistent IAB was a predictor of AF recurrence. (15)

In another study, we included 100 patients undergoing AF ablation and demonstrated a strong association between IAB and AF recurrence within one year after the procedure. (16)

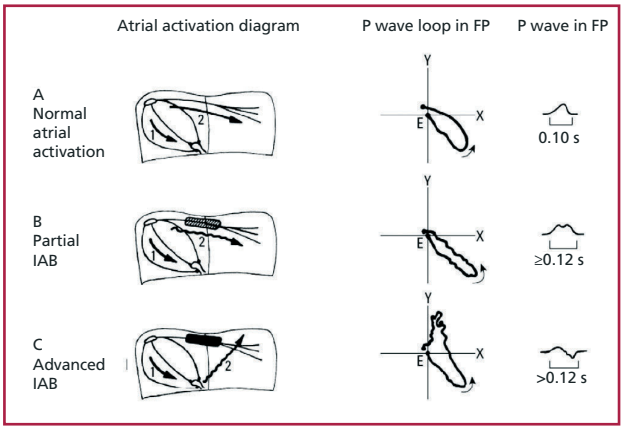

Fig. 1. A. Diagram of normal interatrial activation. **B.** First-degree or partial interatrial block. **C.** Third-degree or advanced interatrial block. IAB: Interatrial block. FP: Frontal plane. Published with permission of Goyal and Spodick (21). Reproduced with authorization.

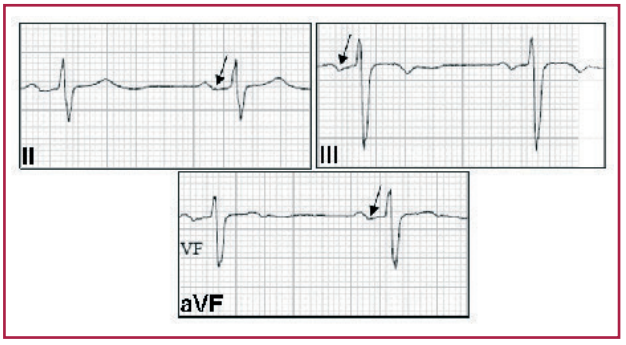

Fig. 2. Advanced interatrial block. Notice the P wave prolongation (125 ms) and the final negative component in the three inferior leads (II, III and aVF) (arrows).

In a population undergoing coronary revascularization surgery, our aim was to determine the prevalence of IAB and its possible association with the development of AF in the immediate postoperative period. The results of this study were negative, without any association between both conditions. We were not surprised by these findings, as many variables intervening during and immediately after a cardiovascular surgery may reduce the predictive value of IAB. (17)

In a substudy of the multicenter FECHA trial (Fragmented ECG in patients with CHAgas' cardiomyopathy), in which several centers of Argentina participated (18) and is currently under revision, we determined the presence of a strong association between IAB and new onset AF in a population of patients with Chagas´ disease with advanced cardiomyopathy and implanted cardioverter defibrillator. Interatrial block was also associated with a significant increase of inappropriate therapies due to AF.

CONCLUSIONS

The evidence that IAB represents an electroanatomic substrate for the development of supraventricular arrhythmias, as described by Dr. Bayés de Luna in the

late 60s and confirmed in several subsequent studies, has prompted us to suggest that this association (IAB + supraventricular arrhythmias, particularly atypical atrial flutter and AF) should be known with the eponym of Bayés syndrome. (19-21)

This is the tribute of this group of Argentine investigators to one of the most valuable scientific contributions made by the great Catalan master of clinical electrocardiography.

Conflicts of interest

None declared.

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